REMARKS

Claim 1, as amended, appears in this application for the Examiner's review and consideration. Table 3 of the specification has been amended to delete rows 1 to 7 and 9. The amendments are fully supported by the specification and claims as originally filed. In particular, support for the recitation in the claims of:

"Si: less than 0.2%" is found in paragraph [0017] of the published application;

"B: 0.0001 to 0.0030%" is found in paragraph [0023] of the published application;

The 3.5 percent lower limit of the area ratio of the tempered martensite is found at page 6, Table 3, Experiment 12, of the published application;

The 11 volume percent upper limit of the residual austenite is found at page 6, Table 3, Experiment 10, of the published application; and

"said metal structure is obtained . . . - 17 x Cr(%) - 2l x Mo(%) (1)" is found in paragraphs [0025], [0027], [0028], [0037], and [0041] of the published application.

Therefore, there is no issue of new matter.

Claim 1 stands rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement, for the reasons set forth on pages 2 and 3 of the Final Office Action.

In response, Applicants submit that it is well settled law that an Applicant need not claim all that is disclosed. Therefore, the present specification fully supports the recitation of "consisting of" in claim 1. However, to facilitate the early allowance of the claim, Applicants have amended claim 1 to change "consisting of" to "comprising."

Therefore, the claim clearly meets the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. § 112, first paragraph.

Claim 1 stands rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over European Patent Application Publication No. EP 1 160 346 (EP '346), for the reasons set forth on pages 3 and 4 of the Final Office Action.

In response, Applicants submit that the presently claimed invention is directed to a hot dip galvanized high strength steel sheet, excellent in plating adhesion and hole expandability. The presently claimed hot dip galvanized high strength steel sheet comprises, in mass percent: C: 0.08 to 0.35 percent, Si: less than 0.2 percent, Mn: 0.8 to 3.5 percent, P: 0.03

percent or less, S: 0.03 percent or less, Al: 0.25 to 1.8 percent, Mo: 0.05 to 0.35 percent, N: 0.010 percent or less, and B: 0.0001 to 0.0030 percent, as well as one or more of Ti: 0.01 to 0.3 percent, Nb: 0.01 to 0.3 percent, V: 0.01 to 0.3 percent, Cu: 1 percent or less, and Cr: 1 percent or less, and has a balance of Fe and unavoidable impurities.

The presently claimed hot dip galvanization steel sheet is characterized in that the steel sheet has a metal structure having, by area ratio, 3.5 percent to 10 percent of tempered martensite, by volume percent, 5 percent to 11 percent of residual austenite, ferrite, and bainite. The metal structure of the presently claimed hot dip galvanization steel sheet is obtained by annealing at 680° to 930°C, cooling, holding at a temperature range of 400° to 500°C for 60 seconds to 20 minutes, then cooling to the martensite transformation point, Ms (°C) or less, then heating to a temperature at 250 to 600°C, hot dip galvanizing and preferably hot dip galvannealing, and cooling to ordinary temperature. Ms (°C) is determined from equation (1):

$$Ms(°C) = 561 - 473 \times C(\%) - 33 \times Mn(\%) - 17 \times Ni(\%) - 17 \times Cr(\%) - 21 \times Mo(\%) \quad (1).$$

As discussed in the present specification at paragraph [0004] of the published application, conventional TRIP steel provides an inferior hole expandability because of a large hardness difference between ferrite and martensite transformed from residual austenite. *See*, the published application, paragraph [004].

The present invention, however, has an excellent hole expandability although the present invention is categorized as TRIP steel. That is because the balance of hardness between the soft structure and hard structure is improved by having a metal structure obtained by the process regulated in claim 1, and, as a result, the local elongation of the presently claimed hot dip galvanization steel sheet is improved compared to the prior art TRIP steel. *See*, the published application, paragraph [0029].

In addition, it is difficult to uniformly adhere plating to conventional TRIP steel, and hot dip galvanization is poor in conventional TRIP steel because of the Si content of greater than 1 percent. *See*, the published application, paragraph [0003].

EP '346, at paragraph [0013], also discloses:

> Si does not dissolve in cementite and therefore delays the transformation from austenite to cementite at 350-600°C because its controlling process is the diffusion of Si which is very slow at the temperature. The chemical stability of austenite increases during this time because of accelerated C

> concentration in the austenite, causing transformation-induced plasticity and making it possible to guarantee retained austenite to contribute to satisfactory formability. ***If the amount of Si is less than 0.2% this effect cannot be achieved.*** On the other hand, it must be no greater than 2.0% because, if the Si concentration is any higher, the plating properties are impaired. (Emphasis added)

Therefore, EP '346 teaches away from the presently claimed hot dip galvanization steel sheet, which contains Si in an amount of less than 0.2 percent, providing excellent plating adhesion and hole expandability. *See*, the published application, paragraph [0007]. Thus, EP '346 does not disclose or suggest the presently claimed hot dip galvanization steel sheet, and provides no reason for one of ordinary skill in the art to make and/or use a hot dip galvanization steel sheet containing less than 0.2 percent Si.

In addition, the metallic structure of the presently claimed hot dip galvanization steel sheet is significantly different from that of the steel sheet disclosed by EP '346. It is well settled law that, for an obviousness rejection to stand, the prior art must provide any enabling disclosure to make the claimed product. In contrast to the presently claimed hot dip galvanization steel sheet, the steel sheet disclosed by EP '346 is hot dip galvanized immediately after cooling to 350° to 500°C from 650° to 900°C. *See*, EP '346, paragraph [0031].

In contrast, the presently claimed hot dip galvanization steel sheet is first cooled to at least the martensite transformation point Ms(°C), which is determined by equation(1), and then heated to a temperature at 250° to 600°C before the steel is hot dipped galvanized. That process provides a hot dip galvanization steel sheet having, by area ratio, 3.5 to 10 percent tempered martensite, by volume percent, 5 to 11 percent of residual austenite, ferrite and bainite, and an improved balance of hardness between the soft structure and hard structure even with a Si content of less than 0.2 percent. EP '346 does not disclose or suggest an enabling disclosure for method for making the presently claimed hot dip galvanization steel sheet, and provides no reason for one of ordinary skill in the art to make and/or use a hot dip galvanization steel sheet containing less than 0.2 percent Si.

Therefore, as EP '346 teaches away from the presently claimed hot dip galvanization steel sheet, and fails to provide any reason for one of ordinary skill in the art to make and/or use the presently claimed hot dip galvanization steel sheet, claim 1 is not obvious over that

reference. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. § 103(a) over EP '346.

Claim 1 stands rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over Japanese Patent Application Publication No. JP 2003-105491 (JP '491), for the reasons set forth on pages 4 to 6 of the Final Office Action.

In response, Applicants submit that JP '491 discloses a high-strength galvanized steel, having a composition containing, by mass percent, 0.08 to 0.3 percent C, less than 0.2 percent Si, 0.8 to 2.8 percent Mn, 0.03 percent or less P, 0.03 percent or less S, 0.25 to 1.8 percent Al, 0.05 to 0.3 percent Mo, and 0.01 percent or less N, as well as one or more selected from 1.0 percent or less Cu, 1.0 percent or less Ni, and 1.0 percent or less Cr, with a balance of Fe and inevitable impurities. The galvanized steel disclosed by JP '491 has a metallic structure containing ferrite, 5 percent or more retained austenite, and bainite. *See*, JP '491 paragraph [0009] and the Abstract.

JP '491 discloses that the disclosed high strength galvanized steel sheet is produced in a method characterized by steps of: rolling up a hot-rolled steel sheet at 450° to 600°C, annealing the steel sheet at 750° to 850°C after cold-rolling, and cooling at more than 7°C/second in a melting galvanizing annealing process. The mass percent of C, Mn, and Mo and the cooling-rate, CR (°C/sec), in an annealing process satisfy the equation

$$(C):\ 1.3<(C+\log CR+Mn/8+2*Mo)< 2.4.$$

In contrast to the presently claimed hot dip galvanization steel sheet, none of the galvanized steel sheets disclosed in JP '491 contain B. The presently claimed hot dip galvanization steel sheet contains 0.0001 to 0.003 percent B as an element required to improve the local ductility and hole expandability. *See*, the published application, paragraph [0023] and Table 1. As JP '491 fails to disclose or suggest that the addition of 0.0001 to 0.003 percent B is required to improve the local ductility and hole expandability, JP '491 does not provide any reason for one of ordinary skill in the art to make and/or use the presently claimed hot dip galvanization steel sheet.

In addition, as discussed above the metal structure of the presently claimed hot dip galvanization steel sheet has, by area ratio, 3.5 to 10 percent tempered martensite, by volume percent, 5 to 11 percent residual austenite, and ferrite and bainite. The metal structure of the presently claimed hot dip galvanization steel sheet is obtained by annealing at 680° to 930°C, cooling, holding at a temperature of 400° to 500°C for 60 seconds to 20 minutes, then cooling

to the martensite transformation point Ms (°C), as determined by the equation recited in the claim, or below, then heating to a temperature of 250° to 600°C, hot dip galvanizing, preferably, hot dip galvannealing, and cooling to ordinary temperature.

The presently claimed hot dip galvanization steel sheet requires galvanizing after cooling to the martensite transformation point Ms(°C) or below, then heating to 250° to 600°C.

In contrast, the galvanized steel sheet disclosed in JP '491 is produced by galvanizing after annealing, and then cooling the steel sheet without reheating before galvanizing. That process will not produce the presently claimed hot dip galvanization steel sheet. As discussed above, it is well settled law that, for an obviousness rejection under 35 U.S.C. § 103(a) to stand, the cited prior art must provide an enabling disclosure for producing the claimed product. As JP '491 does not enable one of ordinary skill in the art to make and/or use the presently claimed hot dip galvanization steel sheet, JP '491 fails to provide the required enabling disclosure.

As further evidence that the presently claimed hot dip galvanization steel sheet is not obvious over the prior art, Applicants submit herewith Figures 1 and 2, based on the data provided in Tables 1 to 3 of the present specification. Figure 1

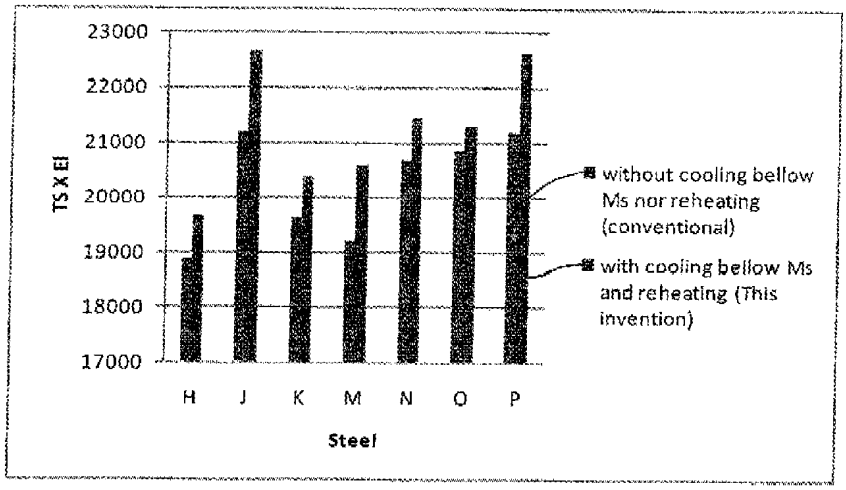

Figure 1

illustrates the values for TS x EL (tensile strength times elongation) of steel types H, J, K, and M to P of the presently claimed hot dip galvanization steel sheet and a corresponding conventional steel sheet of the same composition. It is clear that TS x EL of the present invention is greater than the value of TS x EL for the conventional steel sheets.

Figure 2

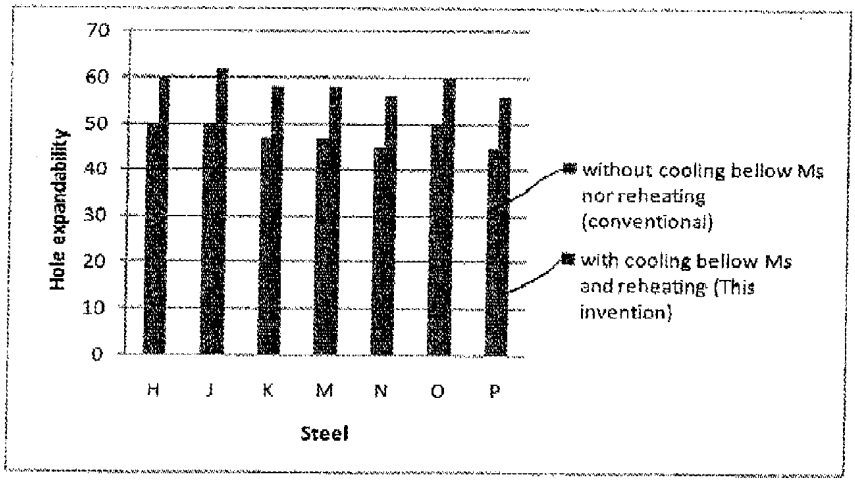

Figure 2

illustrates the hole expandability of the presently claimed hot dip galvanization steel sheet invention and conventional steel sheets of the same composition. Clearly, the hole expandability of the presently claimed hot dip galvanization steel sheet is significantly greater than the hole expandability of the conventional steel sheets.

As illustrated in Figures 1 and 2, the properties of the presently claimed hot dip galvanization steel sheet are significantly and unexpectedly improved over conventional steel sheets. Therefore, the presently claimed hot dip galvanization steel sheet provides unexpected results.

Therefore, as JP '491 fails to provide any reason for one of ordinary skill in the art to make and/or use the presently claimed hot dip galvanization steel sheet, claim 1 is not obvious over that reference. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. § 103(a) over JP '491.

Claim 1 stands provisionally rejected on the ground of obviousness type double patenting, as allegedly being unpatentable over claims 1 to 7 of co-pending U.S. Patent Application No. 10/560,989 in view of EP '346 and over claims 1 to 10 of co-pending U.S. Patent Application No. 10/558,579.

In response, Applicants submit that the required Terminal disclaimer will be submitted upon an indication of allowable subject matter in the present claim.

Applicants thus submit that the entire application is now in condition for allowance, an early notice of which would be appreciated. Should the Examiner not agree with

Applicants' position, a personal or telephonic interview is respectfully requested to discuss any remaining issues prior to the issuance of a further Office Action, and to expedite the allowance of the application.

A separate Petition for Extension of Time and an RCE Transmittal are submitted herewith. Should any other fees be due, please charge such fees to Deposit Account No. 11-0600.

Respectfully submitted,
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Dated: April 14, 2010

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